

 <p align="center">IN THE UNITED STATES PATENT AND TRADEMARK OFFICE</p>	Application Number	09/787,907
	Filing Date	March 29, 2001
	First Named Inventor	SHIMA
	Group Art Unit	1742
	Examiner Name	Wilkins III, Harry D.
	Attorney Docket Number	2922-109
Title: AUXILIARY MATERIAL FOR SUPERCONDUCTIVE MATERIAL		

DECLARATION ACCORDING 37 C.F.R. §1.132

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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Sir:

The undersigned declares that:

1. I, Kunihiro Shima, am the applicant of the above identified application and am employed at Tanaka Kikinzoku Kogyo K.K. Hiratsuka Plant. I graduated from the Graduate School of Tohoku University, specializing in Material Property. At Tanaka Kikinzoku Kogyo K.K., I have been engaged in the study and manufacture of products concerning silver alloys. In addition to the development of superconducting subsidiary materials I am also engaged in the development of solar cell interconnector materials and highly-permeable silver-alloy materials.

2. I am familiar with the technology in US patent application No. 09/701,379. Further, I am familiar with the prior art in the field of silver-alloy subsidiary materials for superconducting materials. In particular I have reviewed and am familiar with the Sato JP 09-112355A reference and the TenBrink et al (JP 06-045132) reference cited in the Office Action of July 22, 2003.

3. Two samples were prepared at Tanaka Kikinzoku Kogyo K.K., one according to the

prior art (Sato) and one sample according to the current invention. The prior art (Sato) sample is a silver alloy with 0.4% Mg and 1.0% Ni. In preparing this test material, the silver alloy was heated at 820°C for four (4) hours at atmospheric pressure. The sample of the current invention is a silver alloy with 0.2% Mg. The silver alloy was prepared through heat-treatment of the silver alloy at 750°C for one (1) hour and oxygen at 5 atm.

4. The internal oxidation of these samples was confirmed by inspection of the internally oxidized material, measuring the depth to which the material was oxidized. The inspection is conducted by measuring the oxygen concentration throughout the cross section of each material following heat treatment. The depth where the oxygen concentration becomes essentially zero is measured where internal oxidation is incomplete.

5. The prior art sample (Sato) is 1 mm thick, therefore to obtain complete internal oxidation a certain duration of time is required for the oxidation to advance at least 0.5 mm, assuming oxidation occurs from both sides. The test sample prepared as described above shows an advancement of internal oxidation after heat treatment to a depth of 0.43 mm. Therefore, the material of the prior art (Sato) was not completely oxidized under these conditions as opposed to the material according to present invention where the oxygen could be detected across the entire cross section.

6. The internal oxidation advancement velocity coefficient D can be calculated using Einstein's equation ($X = (2Dt)^{1/2}$), wherein X equals the depth to which oxidation occurred and t equals the treatment time. Therefore, the material according to the prior art has an internal oxidation advancement velocity coefficient D of $6.420 \times 10^{-6} \text{ mm}^2\cdot\text{s}$. In contrast, the same

velocity coefficient D was observed to be $73.981 \times 10^{-6} \text{ mm}^2\cdot\text{s}$ for the silver alloy prepared according to the current invention.

7. As a measurement of the mechanical strength of the two test materials, data with respect to the Young's modulus, 0.2% proof stress, and tensile strength were obtained.

8. The results of the test, measuring the mechanical properties of the two samples are summarized in table 1 below.

	Young's Modulus	0.2% Proof Stress	Tensile Strength
Current Invention Ag-0.2%Mg	77.2GPa	595MPa	632MPa
Sato's Reference Ag-0.4%Mg-1.0%Ni	81.2GPa	384MPa	435MPa

The amount of Mg in the prior art sample (Sato) is higher than the Mg content in the material according to the present invention. A person of ordinary skill in the art would expect that the increased amount of Mg in the prior art sample would result in a greater strength reflected in the mechanical strength properties of an internally oxidized Ag-Mg alloy. However, the test results in table 1 show that the material according to the current invention has superior mechanical strength notwithstanding the much lower amount of Mg. Therefore, this is opposite what a person of ordinary skill in the art would have expected.

9. Thus the material of the current invention shows superior mechanical strength and superior internal oxidation properties compared to the prior art. In addition, the results with respect to the mechanical strength properties are unexpected, as discussed above.

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10. The undersigned declares further that all statements made herein of his own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Kimber Stine
November 20, 2003